

APPENDIX 8.1E

Construction Emissions and Impact Analysis

Construction Emissions and Impact Analysis

8.1E.1 Construction Phases

Construction of WCEP is expected to last approximately 12 months. The construction will occur in the following four main phases:

- Site preparation;
- Foundation work;
- Construction/installation of major structures; and
- Installation of major equipment.

The WCEP site is approximately 11.48 acres in size and is essentially flat. The site was previously used as a warehouse site. The warehouse will be demolished by the City of Industry as part of its redevelopment plans. As such, the site will require only minimum grading and leveling prior to construction of the power blocks, support systems, and site buildings. Site preparation includes finish grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence.

Fugitive dust emissions from the construction of WCEP will result from:

- Dust entrained during site preparation and finish grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and diesel trucks used to transport workers and materials around the construction site;
- Exhaust from diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site;

- Exhaust from locomotives used to deliver mechanical equipment to the project area; and
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been calculated and evaluated for each source of emissions. Worst-case daily dust emissions are expected to occur during the first month of construction when site preparation occurs. The worst-case daily exhaust emissions are expected to occur during the middle of the construction schedule during the installation of the major mechanical equipment. Annual emissions are based on the average equipment mix during the 12-month construction period.

8.1E.2 Available Mitigation Measures

The following mitigation measures are proposed to control exhaust emissions from the diesel heavy equipment used during construction of WCEP:

- Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel; and
- Use of low-emitting gas and diesel engines meeting state and federal emissions standards (Tier I and II) for construction equipment, including, but not limited to catalytic converter systems and particulate filter systems.

The following mitigation measures are proposed to control fugitive dust emissions during construction of the project:

- Use either water application or chemical dust suppressant application to control dust emissions from on-site unpaved road travel and unpaved parking areas;
- Use vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard;
- Limit traffic speeds on all unpaved site areas to 5 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Replant vegetation in disturbed areas as quickly as possible;
- Use wheel washers or wash off tires of all trucks exiting construction site; and

- Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant.

8.1E.3 Estimation of Emissions with Mitigation Measures

Tables 8.1E-1 through 8.1E-3 show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures. Detailed emission calculations are included in Tables 8.1E-5 through 8.1E-7.

TABLE 8.1E-1
Maximum Daily Emissions During Construction (fugitive dust), pounds per day

	NO _x	CO	VOC	SO _x	PM ₁₀
Onsite					
Construction Fugitive Dust	0	0	0	0	9.17
Offsite					
Worker Travel, Truck/Rail Deliveries	0	0	0	0	0.74
Total =	0	0	0	0	9.91

TABLE 8.1E-2
Maximum Daily Emissions During Construction (exhaust emissions), pounds per day

	NO _x	CO	VOC	SO _x	PM ₁₀
Onsite and Offsite					
Construction Equipment, Worker Travel, Truck/Rail Deliveries	101.2	134.4	20.4	10.9	6.5
Total =	101.2	134.4	20.4	10.9	6.5

TABLE 8.1E-3
Annual Emissions During Construction, tons per year

	NO _x	CO	VOC	SO _x	PM ₁₀
Onsite and Offsite					
Construction Equipment, Fugitive Dust, Worker Travel, Truck/Rail Deliveries	6.7	15.5	2.0	0.5	.4
Total =	6.7	15.5	2.0	0.5	.4
Construction Period Total Emissions (including offsite linear)	6.7	15.5	2.0	0.5	.4
Total Construction Period =	6.7	15.5	2.0	0.5	.4

Appendix 8.1B, Table 8.1B-8 presents the current significance thresholds for the South Coast AQMD, including the thresholds for construction emissions. These significance thresholds are not exceeded except for NO_x which exceeds the daily threshold by 1.2 pounds.

Dispersion modeling of the NO_x emissions at the estimated levels do not cause or contribute to a violation of any NO₂ ambient air quality standard.

8.1E.4 Analysis of Ambient Impacts from Facility Construction

Ambient air quality impacts from emissions during the construction of WCEP were assessed through an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

8.1E.4.1 Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 8.1), monitoring stations delineated in Section 8.1.3 were used to establish the ambient background levels for the construction impact modeling analysis. Table 8.1-43 shows the maximum concentrations of NO₂, SO₂, CO and PM₁₀ recorded for 1996 through 2004 at those monitoring stations.

8.1E.4.2 Dispersion Model

As in the analysis of project operating impacts, the USEPA-approved Industrial Source Complex Short Term (ISCST3) model was used to estimate ambient impacts from construction activities. A detailed discussion of the ISCST3 dispersion model is included in Section 8.1.5.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. An effective emission plume height of 10 feet was used for all exhaust emissions. For construction dust emissions, an effective plume height of 1.64 feet was used in the modeling analysis. The exhaust emissions were modeled as a set of point sources that covered the entire area of the construction site. The dust emissions were modeled as a single area source that covered the total area of the construction site. The construction impacts modeling analysis used the same receptor locations as used for the project operating impact analysis. A detailed discussion of the receptor locations is included in Section 8.1.5.

To determine the construction impacts on short-term ambient air quality standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Tables 8.1E-1 and 8.1E-2 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 8.1E-3 were used. As with the project operating impact analysis, the meteorological data set used for the construction emission impacts analysis was the data collected from the AQMD Walnut meteorological monitoring station for 1981.

8.1E.4.3 Modeling Results

Based on the emission rates of NO_x, SO₂, CO, and PM₁₀ and the meteorological data, the ISCST3 model calculates hourly and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour, 8-hour, and 24-hour ambient impacts are based on the worst-case daily emission rates of NO_x, SO₂, CO, and PM₁₀. The annual impacts are based on the annual emission rates of these pollutants.

The one-hour and annual average concentrations of NO₂ were computed following the revised USEPA guidance for computing these concentrations (August 9, 1995 Federal Register, 60 FR 40465). The one-hour average was adjusted using the Ozone Limiting Method. The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO₂/NO_x ratio.

The modeling analysis results are shown in Table 8.1E-4. Also included in the table are the maximum background levels that have occurred in the last three years and the resulting total ambient impacts. As shown in Table 8.1E-4, construction impacts for all modeled pollutants are expected to be below the most stringent state and national standards. However, the state and federal 24-hour and annual average PM₁₀ standards are exceeded in the absence of the construction emissions for WCEP.

TABLE 8.1E-4
Modeled Maximum Construction Impacts

Pollutant	Averaging Time	Maximum Construction Impacts ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$)	Total Impact ($\mu\text{g}/\text{m}^3$)	State Standard ($\mu\text{g}/\text{m}^3$)	Federal Standard ($\mu\text{g}/\text{m}^3$)
NO ₂	1-hour Annual	82.5 1.4	297 67.9	379.5 69.5	470 -	100
SO ₂	1-hour	11.2	52.4	63.6	650	-
	3-hour	6.9	52.4	59.3	-	1300
	24-hour	1.9	25.4	27.3	109	365
	Annual	0.3	8	8.3	-	80
CO	1-hour	49	12650	12699	23,000	40,000
	8-hour	25	4989	5014	10,000	10,000
PM ₁₀	24-hour Annual ^b	22.8 2.6	164 58.1	186.8 60.7	50 30	150 -

Notes:

^aARM applied for annual average, using national default 0.75 ratio.

^bAnnual Arithmetic Mean.

^cBased on maximum daily emissions.

^dBased on maximum daily emissions.

The ISCST3 model tends to over predict construction emission impacts from fugitive dust due to the cold plume (i.e., ambient temperature) effect of dust emissions. Most of the plume dispersion characteristics in the ISCST3 model are derived from observations of hot plumes associated with typical smoke stacks. The ISCST3 model does compensate for plume temperature; however, for ambient temperature plumes the model assumes negligible buoyancy and dispersion. Consequently, the ambient concentrations in cold plumes remain high even at significant distances from a source. WCEP construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards. The input and output modeling files are being provided electronically.

ATTACHMENT 8.1E-1

Detailed Emission Calculations

Table 8.1E-5 Construction Emissions Calculations

Table 8.1E-6 SCAQMD Emfac Data (Years 2003-2025)

Table 8.1E-7 Construction Equipment Emissions Factors (CEC)

Table 8.1E5 CONSTRUCTION PHASE-Equipment Exhaust Emissions

Project:	Edison Mission Energy-Walnut Creek Energy Park							Projected Construction Year(s): 2007-2008			
	Equip. Type	# On Site	Est. HP Each	Fuel Type	Avg. Load Factor %	Avg. Daily Hours	Adj. Daily Hours	Total Days	Total Adj. Hours	Total HP/Hrs	Total Un-Adj. Hours
	(a)	(b)	(c)	(d)	(e)	(f)	(g)				
Dozer	0	120	D	67.9	10	0.00	0	0.0	0.0	0.0	0
Loader	1	175	D	53.5	10	5.35	15	80.2	14031.2	150	0
Scraper	0	250	D	75.9	10	0.00	0	0.0	0.0	0.0	0
Grader	1	175	D	52.9	10	5.29	5	26.5	4628.8	50	0
Crane	1	175	D	49.4	10	4.94	220	1086.9	190205.4	2200	0
Forklift	2	120	D	34.5	10	6.90	220	1518.0	182160.0	2200	0
Backhoe	1	50	D	53.5	10	5.35	30	160.4	8017.8	300	0
Dump Truck	1	250	D	43.7	8	3.50	15	52.4	13110.0	120	0
Water Truck	1	175	D	43.7	10	4.37	30	131.1	22942.5	300	0
Service Truck	1	175	D	43.7	10	4.37	180	786.6	137655.0	1800	0
Fuel Truck	1	175	D	43.7	8	3.50	180	629.3	110124.0	1440	0
Boom Truck	1	175	D	49.4	10	4.94	60	296.4	51874.2	600	0
Concrete Pump	1	175	D	71.3	8	5.70	30	171.1	29946.0	240	0
Port. Air Comp.	2	50	D	55.2	8	8.83	180	1589.8	79488.0	1440	0
Port. Elec. Gen	2	25	D	85.1	8	13.62	90	1225.4	30636.0	720	0
Port. Light Plant	2	25	D	71.3	8	11.41	30	342.2	8556.0	240	0
Trencher	1	120	D	79.9	8	6.40	30	191.9	23025.0	240	0
Compactor	1	120	D	66.1	8	5.29	4	21.2	2540.1	32	0
Paver	1	120	D	68.1	8	5.45	3	16.3	1960.7	24	0
***	0	0	D	0.0	0	0.00	0	0.0	0.0	0	0
***	0	0	D	0.0	0	0.00	0	0.0	0.0	0	0

(a) Ref: South Coast AQMD-CEQA Handbook, Table A9-8-C, and updated CEC data (see at end of this Appendix).

(b) D=diesel, G=gasoline

(c) Ref (a) Table A9-8-D, increased by 15% to adj for updated load levels

(d) Ref (a) Table A9-8-C (at 100% load)

(e) Adjusted daily hours at average load factor.

(f) Total estimated days on site from construction schedule.

(g) Total operational hours during construction phase at average load factor.

Note: Equipment exhaust emissions factors are based on data derived from the SC AQMD website (Air Quality Planning section) and data supplied by CEC for selected equipment categories, etc. (August 2005)

EMISSIONS FACTORS (h)		Equipment Exhaust Data					
Equip.-Type	HP	lbs/hp-hr CO	g/hp-hr VOC	lbs/hp-hr NOx	g/hp-hr SOx	lbs/hp-hr PM10	g/hp-hr
Dozer	120	0.0041	1.9	0.0012	0.5	0.0084	3.8
Loader	175	0.0033	1.5	0.0007	0.3	0.007	3.2
Scraper	250	0.0024	1.1	0.0007	0.3	0.0104	4.7
Grader	175	0.0038	1.7	0.0008	0.4	0.0084	3.8
Crane	175	0.0026	1.2	0.0006	0.3	0.0055	2.5
Forklift	120	0.0021	1.0	0.0007	0.3	0.0041	1.9
Backhoe	50	0.0094	4.3	0.0036	1.6	0.0071	3.2
Dump Truck	250	0.0016	0.7	0.0005	0.2	0.0079	3.6
Water Truck	175	0.0042	1.9	0.001	0.5	0.0092	4.2
Service Truck	175	0.0042	1.9	0.001	0.5	0.0092	4.2
Fuel Truck	175	0.0042	1.9	0.001	0.5	0.0092	4.2
Boom Truck	175	0.0042	1.9	0.001	0.5	0.0092	4.2
Concrete Pump	175	0.02	9.1	0.003	1.4	0.024	10.9
Port. Air Comp.	50	0.0067	3.0	0.0027	1.2	0.0062	2.8
Port. Elec. Gen	25	0.0021	1.0	0.0014	0.6	0.0038	1.7
Port. Light Plant	25	0.0021	1.0	0.0014	0.6	0.0038	1.7
Trencher	120	0.0034	1.5	0.0008	0.4	0.0061	2.8
Compactor	120	0.0032	1.5	0.0008	0.4	0.0058	2.6
Paver	120	0.0038	1.7	0.0009	0.4	0.0069	3.1
***	0	0	0.0	0	0.0	0.0	0.0
***	0	0	0.0	0	0.0	0.0	0.0

(h) Ref: Updated factors provided by CEC, August 2005 (2006 factors used), i.e., estimated construction period.
(see EF sheets at end of this Appendix)

Equip. Type	CO lbs/day	VOC lbs/day	Construction Equipment Emissions				SOx lbs/day	PM10 lbs/day	tons*
			tons*	lbs/hr	lbs/hr	NOx lbs/day			
Dozer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader	0.31	2.47	0.02	0.07	0.52	0.00	0.65	5.24	0.05
Scraper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grader	0.35	2.81	0.01	0.07	0.59	0.00	0.78	6.22	0.02
Crane	0.22	1.80	0.25	0.05	0.41	0.06	0.48	3.80	0.52
Forklift	0.17	1.39	0.19	0.06	0.46	0.06	0.34	2.72	0.37
Backhoe	0.25	2.01	0.04	0.10	0.77	0.01	0.19	1.52	0.03
Dump Truck	0.17	1.40	0.01	0.05	0.44	0.00	0.86	6.90	0.05
Water Truck	0.32	2.57	0.05	0.08	0.61	0.01	0.70	5.63	0.11
Service Truck	0.32	2.57	0.29	0.08	0.61	0.07	0.70	5.63	0.63
Fuel Truck	0.32	2.57	0.23	0.08	0.61	0.06	0.70	5.63	0.51
Boom Truck	0.36	2.90	0.11	0.09	0.69	0.03	0.80	6.36	0.24
Concrete Pump	2.50	19.96	0.30	0.37	2.99	0.04	2.99	23.96	0.36
Port. Air Comp.	0.37	2.96	0.27	0.15	1.19	0.11	0.34	2.74	0.25
Port. Elec. Gen	0.09	0.71	0.03	0.06	0.48	0.02	0.16	1.29	0.06
Port. Light Plant	0.07	0.60	0.01	0.05	0.40	0.01	0.14	1.08	0.02
Trencher	0.33	2.61	0.04	0.08	0.61	0.01	0.59	4.68	0.07
Compactor	0.25	2.03	0.00	0.06	0.51	0.00	0.46	3.68	0.01
Paver	0.31	2.48	0.00	0.07	0.59	0.00	0.56	4.51	0.01
***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	5.84	46.73	1.80	1.35	10.79	0.49	9.84	78.72	3.21
									1.33
									10.67
									0.45
									0.66
									0.24

*tons = tons emitted during construction phase

CONSTRUCTION PHASE-Fugitive Dust Emissions

Page 4

		Site Acreage Subject to Construction Activity:		Additional PM10 Control Techniques	
Total Site Acreage:	11.48		10 (site plus linear areas)	Type	Used
Emission Factor:	0.11 Month = lbs/hr =	tons/acre/month of activity (see Ref.) Hrs (avg) PM10 emissions-unadjusted		Watering	Yes
	720			Surface Sealant	No
	0.306			Dust Suppressant	No
				Speed Control	Yes
Construction Site Activity Levels					% Control:
Hrs/Day:	12				75
Days/Wk:	6	lbs/hr:	3.1		
Days/Month:	26	lbs/day:	36.7		
Months/Construction:	3	tons* :	1.4		
Annual Const Hours:	3744				
Total Construction Hrs:	936.0				
Total Const Period:	12	months			

Controlled PM10 Emissions:

Controlled PM10 Emissions:	lbs/hr:	0.8
	lbs/day:	9.17

*tons - tons emitted during the construction phase

tons* :

Annualized g/sec:

24 hr g/sec value:

0.358

0.01

0.048

Ref: MRI Report, assumes 50% control due to watering, for intensive earth moving activities.
This factor has been further reduced due to the additional controls of more watering and speed controls on-site.
** Although the complete construction period is 12 months, the maximum fugitive dust emissions will occur in the early phase of construction, and are not expected to last more than 3 months. After month 3, fugitive dust emissions will be well below the maximum hourly and daily values presented above.

CONSTRUCTION PHASE - Truck Delivery Emissions

	Emissions Factors (lbs/vmt)				PM10	
	NOx	CO	VOC	SOx	0.000405	Ref: SCAQMD Emfac 2002 Ver 2.2, 4-03 (website)
Max # deliveries/day:	18					
Avg Haul Distance (miles)	19	see note below				
VMt/Day:	342					
Work days/yr:	312					
Total Const Work Days:	312					
	NOx	Daily Emissions (lbs)		SOx	PM10	On-Road Heavy Duty Diesels (2006)
	13.314	CO	VOC	0.139	0.250	
		2.029	0.452			

Haul distance assumes: 50% of deliveries from adjacent intermodal yard @ 1 mile, 25% from Port of LA @ 36 miles, 25% from Port of LB @ 37 miles.

	Construction Period Emissions (tons)				PM10	
	NOx	CO	VOC	SOx	0.022	0.039
	2.077	0.316	0.070			

CONSTRUCTION PHASE - Rail Delivery Emissions

Railway emissions calculations should be performed using the updated Locomotive Emissions calculation procedures, with the final values in terms of tons per const period entered in the appropriate cells below.

The Locomotive Emissions Calculation procedures are attached.

	Railway Delivery Emissions				PM10	
	NOx	CO	VOC	SOx	0.000	0.000
	0	0.000	0.000	0.000		

Data from Locomotive Emissions Calculations > > > >

Edison Mission Energy is not projecting any rail deliveries for this project.

CONSTRUCTION PHASE - Worker Travel - Emissions

		Emissions Factors (lbs/VMT)				
		NOx	CO	VOC	SOx	PM10
Ref: SCAQMD Emfac 2002 Ver 2.2, 4-03 (website) On-Road Vehicles (2006)						
Avg # of Workers/Day:	123					
Avg Occupancy/Vehicle:	1.2					
Round Trips/Day:	103					
Avg Roundtrip Distance:	60 miles					
VMT/Day:	6150					
VMT/Year:	1918800					
VMT/Const Period:	1918800					
Avg. Daily Emissions (lbs)						
Max # of Workers/Day:	228					
Max Work Month:	8					
Round Trips/Day:	190					
VMT/Day:	11400					
Monthly Emissions (lbs)						
Max # of Workers/Day:	228					
Max Work Month:	8					
Round Trips/Day:	190					
VMT/Day:	11400					
Maximum Daily Emissions (lbs) Month 8						
Max # of Workers/Day:	228					
Max Work Month:	8					
Round Trips/Day:	190					
VMT/Day:	11400					
Construction Period Emissions (tons)						
NOx						PM10
CO						0.077
VOC						
SOx						
PM10						
1.429	13.360	1.436	0.009			

CONSTRUCTION PHASE - Emissions Summary

Construction Dust:	
PM10	Avg.
0.8	lbs/hr
9.2	lbs/day
0.4	tons/const period
0.048	g/sec (24 hr basis)
0.01	annualized g/sec
annualized	
tons/construction period	
NOx	Avg lbs/day
CO	101.2
VOC*	134.4
SOx	20.4
PM10	10.9
	6.5
tons/construction period	
NOx	6.7
CO	15.5
VOC*	2.0
SOx	0.5
PM10	0.4
annualized	
g/sec	
NOx	0.1933
CO	0.4457
VOC*	0.0574
SOx	0.0137
PM10	0.0103

Table 8.1E-6 SCAQMD Emfac Data (Years 2003-2025)

**Highest (Most Conservative) EMFAC 2002 (version 2.2)
Emission Factors for On-Road Vehicles**

Projects in the SCAQMD (Scenario Years 2003 - 2025)

Derived from Wintertime Emissions Inventory (except Annual Average CO for passenger vehicles)
Passenger Vehicles (<8500 pounds), Delivery Trucks (>8500 pounds)

The following emission factors were compiled by running the California Air Resources Board's EMFAC2002 (version 2.2) Burden Model, taking the weighted average of vehicle types and simplifying into two categories which can be used to calculate on-road mobile source emissions. Use the following equation:

$$\text{Emissions (pounds per day)} = N \times TL \times EF$$

where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)

This methodology replaces the old EMFAC emission factors in Tables A-9-5-J-1 through A-9-5-L in Appendix A9 of the current SCAQMD CEQA Handbook. All the emission factors account for the emissions from start, running and idling exhaust. In addition, the ROG emission factors take into account diurnal, hot soak, running and resting emissions, and PM10 emission factor takes into account the tire and brake wear.

Scenario Year: 2003 -- Model Years: 1965 to 2003

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.01815	CO	0.025508
NOx	0.002014	NOx	0.031208
ROG	0.001935	ROG	0.003362
SOx	0.00001	SOx	0.000241
PM10	0.000078	PM10	0.000540

Scenario Year: 2004 -- Model Years: 1965 to 2004

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.016559	CO	0.02309
NOx	0.0018	NOx	0.029607
ROG	0.001771	ROG	0.003148
SOx	0.00001	SOx	0.000243
PM10	0.000079	PM10	0.000519

Scenario Year: 2005 -- Model Years: 1965 to 2005

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.015165	CO	0.020984
NOx	0.001634	NOx	0.028142
ROG	0.001626	ROG	0.002955
SOx	0.00001	SOx	0.000246
PM10	0.000079	PM10	0.000500

Scenario Year: 2006 -- Model Years: 1965 to 2006

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.013925	CO	0.019135
NOx	0.001489	NOx	0.026756
ROG	0.001497	ROG	0.002779
SOx	0.000009	SOx	0.000248
PM10	0.000080	PM10	0.000483

EMFAC 2002 Emission Factors for On-Road Mobile Sources (continued)

Scenario Year: 2007 -- Model Years: 1965 to 2007

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.01282	CO	0.017455
NOx	0.001361	NOx	0.024978
ROG	0.001383	ROG	0.002608
SOx	0.000009	SOx	0.000033
PM10	0.000080	PM10	0.000440

Scenario Year: 2008 -- Model Years: 1965 to 2008

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.011798	CO	0.015942
NOx	0.001245	NOx	0.023199
ROG	0.001277	ROG	0.00245
SOx	0.000009	SOx	0.000033
PM10	0.000080	PM10	0.000419

Scenario Year: 2009 -- Model Years: 1965 to 2009

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.010849	CO	0.01454
NOx	0.001138	NOx	0.021501
ROG	0.001179	ROG	0.002295
SOx	0.000009	SOx	0.000033
PM10	0.000081	PM10	0.000400

Scenario Year: 2010 -- Model Years: 1965 to 2010

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.009954	CO	0.013168
NOx	0.001038	NOx	0.019339
ROG	0.001087	ROG	0.002141
SOx	0.000009	SOx	0.000033
PM10	0.000081	PM10	0.000374

Scenario Year: 2011 -- Model Years: 1966 to 2011

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.009268	CO	0.012065
NOx	0.000952	NOx	0.01704
ROG	0.001015	ROG	0.002031
SOx	0.000009	SOx	0.000033
PM10	0.000083	PM10	0.000357

EMFAC 2002 Emission Factors for On-Road Mobile Sources (continued)

Scenario Year: 2012 -- Model Years: 1967 to 2012

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.008512	CO	0.010982
NOx	0.000868	NOx	0.01529
ROG	0.000941	ROG	0.001909
SOx	0.000009	SOx	0.000034
PM10	0.000083	PM10	0.000337

Scenario Year: 2013 -- Model Years: 1968 to 2013

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.007818	CO	0.010047
NOx	0.000791	NOx	0.013737
ROG	0.000874	ROG	0.001803
SOx	0.000009	SOx	0.000034
PM10	0.000083	PM10	0.000318

Scenario Year: 2014 -- Model Years: 1969 to 2014

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.007186	CO	0.009273
NOx	0.000721	NOx	0.012369
ROG	0.000813	ROG	0.001712
SOx	0.000009	SOx	0.000034
PM10	0.000084	PM10	0.000303

Scenario Year: 2015 -- Model Years: 1970 to 2015

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.006611	CO	0.008582
NOx	0.000659	NOx	0.01116
ROG	0.000759	ROG	0.001635
SOx	0.000009	SOx	0.000034
PM10	0.000084	PM10	0.000289

Scenario Year: 2016 -- Model Years: 1971 to 2016

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.006089	CO	0.00799
NOx	0.000602	NOx	0.010108
ROG	0.00071	ROG	0.001568
SOx	0.000009	SOx	0.000035
PM10	0.000084	PM10	0.000278

EMFAC 2002 Emission Factors for On-Road Mobile Sources (continued)

Scenario Year: 2017 -- Model Years: 1972 to 2017

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.005605	CO	0.007439
NOx	0.000551	NOx	0.009175
ROG	0.000664	ROG	0.001503
SOx	0.000009	SOx	0.000035
PM10	0.000084	PM10	0.000267

Scenario Year: 2018 -- Model Years: 1973 to 2018

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.005162	CO	0.006932
NOx	0.000505	NOx	0.008346
ROG	0.000621	ROG	0.001439
SOx	0.000009	SOx	0.000035
PM10	0.000084	PM10	0.000257

Scenario Year: 2019 -- Model Years: 1974 to 2019

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.004778	CO	0.006512
NOx	0.000465	NOx	0.007615
ROG	0.000585	ROG	0.001382
SOx	0.000009	SOx	0.000035
PM10	0.000084	PM10	0.000248

Scenario Year: 2020 -- Model Years: 1975 to 2020

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.004438	CO	0.006139
NOx	0.00043	NOx	0.006975
ROG	0.000553	ROG	0.001328
SOx	0.000009	SOx	0.000035
PM10	0.000084	PM10	0.000241

Scenario Year: 2021 -- Model Years: 1976 to 2021

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.004166	CO	0.005863
NOx	0.000401	NOx	0.006414
ROG	0.000528	ROG	0.00129
SOx	0.000009	SOx	0.000035
PM10	0.000085	PM10	0.000238

EMFAC 2002 Emission Factors for On-Road Mobile Sources (continued)

Scenario Year: 2022 -- Model Years: 1977 to 2022

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.003883	CO	0.005585
NOx	0.000373	NOx	0.005968
ROG	0.000502	ROG	0.001248
SOx	0.000009	SOx	0.000035
PM10	0.000085	PM10	0.000232

Scenario Year: 2023 -- Model Years: 1978 to 2023

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.003628	CO	0.005344
NOx	0.000348	NOx	0.005585
ROG	0.000477	ROG	0.001211
SOx	0.000009	SOx	0.000035
PM10	0.000085	PM10	0.000228

Scenario Year: 2024 -- Model Years: 1979 to 2024

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.003404	CO	0.005134
NOx	0.000325	NOx	0.005258
ROG	0.000454	ROG	0.001176
SOx	0.000009	SOx	0.000035
PM10	0.000085	PM10	0.000224

Scenario Year: 2025 -- Model Years: 1980 to 2025

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.003216	CO	0.004958
NOx	0.000304	NOx	0.004983
ROG	0.000433	ROG	0.00114
SOx	0.000009	SOx	0.000035
PM10	0.000085	PM10	0.000220

Highest (Most Conservative) EMFAC 2002 (version 2.2, April 23, 2003)

Emission Factors for On-Road Heavy Heavy Duty Diesel Trucks

Projects in the SCAQMD (Scenario Years 2005 - 2025)

Derived from Wintertime Emissions Inventory

Heavy Heavy Duty Diesel Trucks (33,001 to 60,000 pounds)

The following emission factors were compiled by running the California Air Resources Board's EMFAC2002 (version 2.2) Burden Model and extracting the Heavy Heavy Duty Diesel Truck (HHDT) Emission Factors. When calculating on-road mobile source emissions from HHDT, use the following equation:

$$\text{Emissions (pounds per day)} = N \times TL \times EF$$

where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)

The emission factors account for all emissions from start, running and idling exhaust. In addition, the ROG emission factors take into account diurnal, hot soak, running and resting emissions, and PM10 emission factor takes into account the tire and brake wear.

Scenario Year: 2005 -- Model Years: 1965 to 2005

HHDT-DSL (pounds/mile)

ROG 0.001403

CO 0.006308

NOx 0.041541

PM10 0.000774

SOx 0.000404

Scenario Year: 2006 -- Model Years: 1965 to 2006

HHDT-DSL (pounds/mile)

ROG 0.001321

CO 0.005932

NOx 0.03893

PM10 0.00073

SOx 0.000405

Scenario Year: 2007 -- Model Years: 1965 to 2007

HHDT-DSL (pounds/mile)

ROG 0.001227

CO 0.00552

NOx 0.035635

PM10 0.000644

SOx 4.57E-05

Scenario Year: 2008 -- Model Years: 1965 to 2008

HHDT-DSL (pounds/mile)

ROG 0.001133

CO 0.005117

NOx 0.032442

PM10 0.000598

SOx 4.6E-05

Scenario Year: 2009 -- Model Years: 1965 to 2009

HHDT-DSL (pounds/mile)

ROG 0.001042

CO 0.004738

NOx 0.029455

PM10 0.000559

SOx 4.61E-05

Scenario Year: 2010 -- Model Years: 1965 to 2010

HHDT-DSL (pounds/mile)

ROG 0.000948

CO 0.004335

NOx 0.025802

PM10 0.000507

SOx 4.61E-05

Scenario Year: 2011 -- Model Years: 1966 to 2011

HHDT-DSL (pounds/mile)

ROG 0.000888

CO 0.004069

NOx 0.022117

PM10 0.000475

SOx 4.61E-05

Scenario Year: 2012 -- Model Years: 1967 to 2012

HHDT-DSL (pounds/mile)

ROG 0.000813

CO 0.003783

NOx 0.01938

PM10 0.000438

SOx 4.63E-05

Scenario Year: 2013 -- Model Years: 1968 to 2013

HHDT-DSL (pounds/mile)

ROG 0.000749

CO 0.003551

NOx 0.017054

PM10 0.000408

SOx 4.66E-05

Scenario Year: 2014 -- Model Years: 1969 to 2014

HHDT-DSL (pounds/mile)

ROG 0.000696

CO 0.003364

NOx 0.0151

PM10 0.000383

SOx 4.71E-05

Highest (Most Conservative) EMFAC 2002 (version 2.2, April 23, 2003)
Emission Factors for On-Road Heavy Heavy Duty Diesel Trucks (concluded)

Scenario Year: 2015 -- Model Years: 1970 to 2015

HHDT-DSL (pounds/mile)

ROG 0.000651

CO 0.003217

NOx 0.013437

PM10 0.000362

SOx 4.62E-05

Scenario Year: 2016 -- Model Years: 1971 to 2016

HHDT-DSL (pounds/mile)

ROG 0.000615

CO 0.003102

NOx 0.012038

PM10 0.000344

SOx 4.7E-05

Scenario Year: 2017-- Model Years: 1972 to 2017

HHDT-DSL (pounds/mile)

ROG 0.000585

CO 0.003005

NOx 0.010831

PM10 0.00033

SOx 4.63E-05

Scenario Year: 2018-- Model Years: 1973 to 2018

HHDT-DSL (pounds/mile)

ROG 0.000558

CO 0.002928

NOx 0.009786

PM10 0.000317

SOx 4.71E-05

Scenario Year: 2019 -- Model Years: 1974 to 2019

HHDT-DSL (pounds/mile)

ROG 0.000536

CO 0.002862

NOx 0.00888

PM10 0.000305

SOx 4.65E-05

Scenario Year: 2020 -- Model Years: 1975 to 2020

HHDT-DSL (pounds/mile)

ROG 0.000518

CO 0.002807

NOx 0.008102

PM10 0.000295

SOx 4.73E-05

Scenario Year: 2021 -- Model Years: 1976 to 2021

HHDT-DSL (pounds/mile)

ROG 0.000512

CO 0.002807

NOx 0.007438

PM10 0.00029

SOx 4.72E-05

Scenario Year: 2022 -- Model Years: 1977 to 2022

HHDT-DSL (pounds/mile)

ROG 0.000501

CO 0.002782

NOx 0.006926

PM10 0.000283

SOx 4.7E-05

Scenario Year: 2023 -- Model Years: 1978 to 2023

HHDT-DSL (pounds/mile)

ROG 0.000492

CO 0.002759

NOx 0.006491

PM10 0.000278

SOx 4.68E-05

Scenario Year: 2024 -- Model Years: 1979 to 2024

HHDT-DSL (pounds/mile)

ROG 0.000483

CO 0.002737

NOx 0.006126

PM10 0.000273

SOx 4.65E-05

Scenario Year: 2025 -- Model Years: 1980 to 2025

HHDT-DSL (pounds/mile)

ROG 0.000477

CO 0.002716

NOx 0.005822

PM10 0.000269

SOx 4.62E-05

Table 8.1E-7 Emissions Factors for Construction Equipment (CEC)

Eq Type	HP	2005					2006					2007													
		lb/hr	lb/hp-hr	lb/hr	lb/hp-hr	PM10	lb/hr	lb/hp-hr	lb/hr	lb/hp-hr	CO	NOx	PM10	lb/hr	lb/hp-hr	lb/hr	lb/hp-hr	CO	NOx	PM10	lb/hr	lb/hp-hr	SOx	VOC	
Bore/Drill Rigs	15	0.0350	0.0023	0.0700	0.0047	0.0000	0.0000	0.0000	0.0000	0.0690	0.0046	0.0690	0.0000	0.0000	0.0000	0.0000	0.0690	0.0046	0.0690	0.0000	0.0000	0.0000	0.0000		
	25	0.0670	0.0027	0.1230	0.0049	0.0000	0.0000	0.0000	0.0000	0.0780	0.0031	0.1560	0.0062	0.0000	0.0000	0.0000	0.0770	0.0031	0.1550	0.0062	0.0000	0.0000	0.0000		
	50	0.2280	0.0046	0.2800	0.0056	0.0270	0.0005	0.0730	0.0015	0.0580	0.0012	0.2070	0.0041	0.2720	0.0054	0.0250	0.0005	0.0750	0.0015	0.0380	0.0008	0.1900	0.0038	0.2630	0.0053
	120	0.4710	0.0039	0.8220	0.0069	0.0720	0.0006	0.1660	0.0014	0.1010	0.0008	0.4550	0.0038	0.7550	0.0063	0.0560	0.0005	0.1670	0.0014	0.0750	0.0006	0.4440	0.0037	0.6980	0.0058
	175	0.6930	0.0040	1.2950	0.0074	0.0620	0.0004	0.2910	0.0017	0.1090	0.0006	0.6930	0.0040	1.1650	0.0067	0.0510	0.0003	0.2940	0.0017	0.0810	0.0005	0.6880	0.0039	1.0230	0.0058
	250	0.3160	0.0013	1.6320	0.0065	0.0380	0.0002	0.3880	0.0016	0.0630	0.0003	0.3130	0.0013	1.4980	0.0060	0.0380	0.0002	0.3930	0.0016	0.0630	0.0003	0.3110	0.0012	1.3320	0.0053
	500	0.5160	0.0010	2.2940	0.0046	0.0600	0.0001	0.5630	0.0011	0.0850	0.0002	0.5160	0.0010	2.0720	0.0041	0.0590	0.0001	0.5630	0.0011	0.0710	0.0001	0.5170	0.0010	1.7700	0.0035
Cement and Mortar Mixers	750	1.0350	0.0014	4.8060	0.0064	0.1110	0.0001	1.1460	0.0015	0.1230	0.0002	1.0370	0.0014	4.2800	0.0057	0.1100	0.0001	1.1450	0.0015	0.1220	0.0002	1.0250	0.0014	3.6070	0.0048
	15	0.0320	0.0021	0.0580	0.0039	0.0050	0.0003	0.0000	0.0120	0.0008	0.0410	0.0027	0.0700	0.0047	0.0060	0.0004	0.0000	0.0120	0.0008	0.0400	0.0027	0.0650	0.0043		
Concrete/Industrial Saws	25	0.1160	0.0046	0.1800	0.0072	0.0130	0.0005	0.0000	0.0000	0.1150	0.0046	0.2040	0.0082	0.0130	0.0005	0.0000	0.0000	0.1140	0.0046	0.2030	0.0081	0.0130	0.0005	0.0000	0.0000
	50	0.0000	0.0000	0.1430	0.0057	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	120	0.3540	0.0071	0.3370	0.0067	0.0440	0.0009	0.0800	0.0016	0.1770	0.0035	0.3430	0.0069	0.3260	0.0065	0.0440	0.0009	0.0770	0.0015	0.1760	0.0035	0.3580	0.0072	0.3230	0.0065
	175	0.5290	0.0044	1.0990	0.0092	0.1010	0.0008	0.1610	0.0013	0.1510	0.0013	0.5210	0.0043	1.0720	0.0089	0.1000	0.0008	0.1610	0.0013	0.1500	0.0013	0.5170	0.0043	1.0390	0.0087
Cranes	50	0.3130	0.0063	0.2520	0.0050	0.0340	0.0007	0.0550	0.0011	0.1360	0.0027	0.2980	0.0060	0.2470	0.0049	0.0300	0.0006	0.0530	0.0011	0.1010	0.0020	0.2820	0.0056	0.2300	0.0048
	120	0.3620	0.0030	0.6980	0.0058	0.0760	0.0006	0.1090	0.0009	0.1050	0.0009	0.3580	0.0030	0.6610	0.0055	0.0720	0.0006	0.1080	0.0009	0.3530	0.0029	0.6300	0.0053		
	175	0.4560	0.0026	1.0240	0.0059	0.0650	0.0004	0.1670	0.0010	0.1080	0.0006	0.4550	0.0026	0.9680	0.0055	0.0610	0.0003	0.1670	0.0010	0.1000	0.0006	0.4540	0.0026	0.9040	0.0052
	250	0.2600	0.0010	1.3100	0.0052	0.0420	0.0002	0.2330	0.0009	0.0850	0.0003	0.2490	0.0010	1.2520	0.0050	0.0390	0.0002	0.2330	0.0009	0.0780	0.0003	0.2410	0.0010	1.1760	0.0047
	500	0.4050	0.0008	1.8800	0.0038	0.0620	0.0001	0.3260	0.0007	0.1170	0.0002	0.3820	0.0008	1.7520	0.0035	0.0580	0.0001	0.3260	0.0007	0.1070	0.0002	0.3690	0.0007	1.6050	0.0032
	750	0.6640	0.0009	3.2590	0.0043	0.1030	0.0001	0.5600	0.0007	0.1720	0.0002	0.6400	0.0009	3.0450	0.0041	0.1020	0.0001	0.5560	0.0007	0.1710	0.0002	0.6160	0.0008	2.8010	0.0037
Crawler Tractors	50	0.3540	0.0071	0.2840	0.0057	0.0470	0.0009	0.0550	0.0011	0.1580	0.0032	0.3520	0.0070	0.2820	0.0056	0.0470	0.0009	0.0530	0.0011	0.1560	0.0031	0.3500	0.0070	0.2800	0.0056
	120	0.5010	0.0042	1.0430	0.0087	0.1030	0.0009	0.1420	0.0012	0.1530	0.0013	0.4960	0.0041	1.0120	0.0084	0.1010	0.0008	0.1420	0.0012	0.1470	0.0012	0.4940	0.0041	0.9900	0.0083
	175	0.7350	0.0042	1.7520	0.0100	0.1060	0.0006	0.2510	0.0014	0.1840	0.0011	0.7290	0.0042	1.6980	0.0097	0.1040	0.0006	0.2510	0.0014	0.1770	0.0010	0.7270	0.0042	1.6520	0.0094
	250	0.5990	0.0024	2.2560	0.0090	0.0950	0.0004	0.3450	0.0014	0.1790	0.0007	0.5620	0.0022	2.1830	0.0087	0.0900	0.0004	0.3450	0.0014	0.1680	0.0007	0.5360	0.0021	2.1210	0.0085
	500	1.5020	0.0030	3.2180	0.0064	0.1310	0.0003	0.4690	0.0009	0.2430	0.0005	1.3610	0.0027	3.0810	0.0062	0.1240	0.0002	0.4690	0.0009	0.2290	0.0005	1.2460	0.0025	2.9650	0.0059
	750	2.4700	0.0033	5.8190	0.0078	0.2290																			

	500	1.2030	0.0024	3.0110	0.0060	0.1120	0.0002	0.4590	0.0009	0.2120	0.0004	1.0980	0.0022	2.8800	0.0058	0.1050	0.0002	0.4600	0.0009	0.1980	0.0004	1.0150	0.0020	2.7680	0.0055	0.1020	0.0002	0.4600	0.0009	0.1900	0.0004
Pavers	25	0.0920	0.0037	0.2140	0.0086	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1210	0.0048	0.2120	0.0085	0.0000	0.0000	0.0000	0.0000	0.0910	0.0036	0.2110	0.0084	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	50	0.2870	0.0057	0.2860	0.0057	0.0340	0.0007	0.0660	0.0013	0.1020	0.0020	0.2720	0.0054	0.2770	0.0055	0.0320	0.0006	0.0670	0.0013	0.0910	0.0018	0.2600	0.0052	0.2690	0.0054	0.0300	0.0006	0.0670	0.0013	0.0800	0.0016
	120	0.4580	0.0038	0.8650	0.0072	0.0860	0.0007	0.1500	0.0013	0.1230	0.0010	0.4520	0.0038	0.8240	0.0069	0.0800	0.0007	0.1500	0.0013	0.1120	0.0009	0.4470	0.0037	0.7890	0.0066	0.0740	0.0006	0.1500	0.0013	0.1000	0.0008
	175	0.6670	0.0038	1.4720	0.0084	0.0830	0.0005	0.2660	0.0015	0.1430	0.0008	0.6680	0.0038	1.3960	0.0080	0.0780	0.0004	0.2660	0.0015	0.1310	0.0007	0.6680	0.0038	1.2980	0.0074	0.0710	0.0004	0.2660	0.0015	0.1170	0.0007
	250	0.3890	0.0016	2.0570	0.0082	0.0580	0.0002	0.4010	0.0016	0.1150	0.0005	0.3780	0.0015	1.9650	0.0079	0.0540	0.0002	0.4010	0.0016	0.1150	0.0005	0.3640	0.0015	1.8400	0.0074	0.0510	0.0002	0.4010	0.0016	0.1140	0.0005
	500	0.4570	0.0009	2.2080	0.0044	0.0650	0.0001	0.4240	0.0008	0.1120	0.0002	0.4430	0.0009	2.0500	0.0041	0.0610	0.0001	0.4250	0.0009	0.1110	0.0002	0.4290	0.0009	1.8640	0.0037	0.0550	0.0001	0.4250	0.0009	0.1110	0.0002
Paving Equipment	25	0.0490	0.0020	0.0980	0.0039	0.0100	0.0004	0.0000	0.0000	0.0410	0.0016	0.0570	0.0023	0.1240	0.0050	0.0100	0.0004	0.0000	0.0000	0.0140	0.0023	0.1180	0.0047	0.0090	0.0004	0.0000	0.0000	0.0140	0.0006		
	50	0.2910	0.0058	0.2650	0.0053	0.0340	0.0007	0.0540	0.0011	0.1120	0.0022	0.2860	0.0057	0.2630	0.0053	0.0320	0.0006	0.0600	0.0012	0.1110	0.0022	0.2840	0.0057	0.2610	0.0052	0.0330	0.0007	0.0600	0.0012	0.1100	0.0022
	120	0.3900	0.0033	0.8150	0.0068	0.0750	0.0006	0.1180	0.0010	0.1140	0.0010	0.3870	0.0032	0.7910	0.0066	0.0730	0.0006	0.1180	0.0010	0.1100	0.0009	0.3850	0.0032	0.7720	0.0064	0.0720	0.0006	0.1180	0.0010	0.1060	0.0009
	175	0.5770	0.0033	1.3790	0.0079	0.0770	0.0004	0.2100	0.0012	0.1380	0.0008	0.5720	0.0033	1.3360	0.0076	0.0750	0.0004	0.2100	0.0012	0.1320	0.0008	0.5700	0.0033	1.2980	0.0074	0.0740	0.0004	0.2100	0.0012	0.1280	0.0007
	250	0.4070	0.0016	1.5660	0.0063	0.0610	0.0002	0.2540	0.0010	0.1170	0.0005	0.3820	0.0015	1.5160	0.0061	0.0570	0.0002	0.2540	0.0010	0.1070	0.0004	0.3640	0.0015	1.4690	0.0059	0.0550	0.0002	0.2540	0.0010	0.1060	0.0004
Plate Compactors	15	0.0180	0.0012	0.0290	0.0019	0.0020	0.0001	0.0000	0.0000	0.0090	0.0006	0.0260	0.0017	0.0410	0.0027	0.0020	0.0001	0.0000	0.0000	0.0260	0.0017	0.0390	0.0026	0.0020	0.0001	0.0000	0.0000	0.0090	0.0006		
Rollers	15	0.0250	0.0017	0.0390	0.0026	0.0040	0.0003	0.0010	0.0160	0.0011	0.0390	0.0026	0.0590	0.0039	0.0040	0.0003	0.0010	0.0001	0.0080	0.0005	0.0380	0.0025	0.0540	0.0036	0.0040	0.0003	0.0010	0.0001	0.0080	0.0005	
	25	0.0510	0.0020	0.1030	0.0041	0.0090	0.0004	0.0010	0.0380	0.0015	0.0600	0.0024	0.1310	0.0052	0.0080	0.0003	0.0020	0.0001	0.0190	0.0008	0.0580	0.0023	0.1250	0.0050	0.0080	0.0003	0.0020	0.0001	0.0190	0.0008	
	50	0.2590	0.0052	0.2640	0.0053	0.0310	0.0006	0.0620	0.0012	0.0900	0.0018	0.2460	0.0049	0.2550	0.0051	0.0290	0.0006	0.0620	0.0012	0.0810	0.0016	0.2350	0.0047	0.2480	0.0050	0.0270	0.0005	0.0620	0.0012	0.0710	0.0014
	120	0.3870	0.0032	0.7320	0.0061	0.0710	0.0006	0.1270	0.0011	0.1040	0.0009	0.3820	0.0032	0.6960	0.0058	0.0670	0.0006	0.1280	0.0011	0.0940	0.0008	0.3770	0.0031	0.6670	0.0056	0.0610	0.0005	0.1280	0.0011	0.0840	0.0007
	175	0.5580	0.0032	1.2310	0.0070	0.0690	0.0004	0.2240	0.0013	0.1190	0.0007	0.5580	0.0032	1.1670	0.0067	0.0640	0.0004	0.2240	0.0013	0.1070	0.0006	0.5580	0.0032	1.0850	0.0062	0.0590	0.0003	0.2240	0.0013	0.0950	0.0005
	250	0.3060	0.0012	1.6060	0.0064	0.0440	0.0002	0.3170	0.0013	0.0890	0.0004	0.2950	0.0012	1.5360	0.0061	0.0420	0.0002	0.3180	0.0013	0.0880	0.0004	0.2860	0.0011	1.4360	0.0057	0.0410	0.0002	0.3180	0.0013	0.0780	0.0003
Rough Terrain Forklifts	50	0.3930	0.0079	0.3560	0.0071	0.0460	0.0009	0.0810	0.0016	0.1430	0.0029	0.3720	0.0074	0.3440	0.0069	0.0410	0.0008	0.0810	0.0016	0.1280	0.0026	0.3550	0.0071	0.3360	0.0067	0.0410	0.0008	0.0810	0.0016	0.1130	0.0023
	120	0.4300	0.0036	0.8100	0.0068	0.0850	0.0007	0.1350	0.0011	0.1190	0.0010	0.4250	0.0035	0.7710	0.0064	0.0800	0.0007	0.1350	0.0011	0.1090	0.0009	0									

Base Factors g/bhp, if Tier 1 >50 hp (1)										Appendix A Table A3						Adjustment (3)	Adjusted Factors, g/bhp, If Tier 1>50 hp					
Equipment		HP Cat.	Tier	BSFC lb/hp-hr	NOx	CO	POC	SOx	PM10	Adj. Type	NOx	CO	POC	SOx	PM10	PM10 Fuel S	BSFC	NOx	CO	POC	SOx	PM10
Crawler Crane- Greater than 300 ton	175-300	1	0.367	5.5772	0.7475	0.3085	0.00499	0.2521	None	1	1	1	1	1	-0.086	0.367	5.58	0.75	0.31	0.0049	0.17	
Crawler Crane- Greater than 200 ton	175-300	1	0.367	5.5772	0.7475	0.3085	0.00499	0.2521	None	1	1	1	1	1	-0.086	0.367	5.58	0.75	0.31	0.0049	0.17	
Crane - Mobile 65 ton	175-300	1	0.367	5.5772	0.7475	0.3085	0.00499	0.2521	None	1	1	1	1	1	-0.086	0.367	5.58	0.75	0.31	0.0049	0.17	
Cranes -Mobile 45 ton	100-175	1	0.367	5.6523	0.8667	0.3384	0.00499	0.2799	None	1	1	1	1	1	-0.086	0.367	5.65	0.87	0.34	0.0049	0.19	
Cranes - Mobile 35 ton	100-175	1	0.367	5.6523	0.8667	0.3384	0.00499	0.2799	None	1	1	1	1	1	-0.086	0.367	5.65	0.87	0.34	0.0049	0.19	
Bulldozer D6H	100-175	1	0.367	5.6523	0.8667	0.3384	0.00499	0.2799	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	5.37	1.33	0.36	0.0049	0.26	
Bulldozer D4C	50-100	1	0.408	5.5988	2.3655	0.5213	0.00555	0.473	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	5.32	3.62	0.55	0.0055	0.49	
Excavator- Trencher	50-100	1	0.408	5.5988	2.3655	0.5213	0.00555	0.473	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	5.32	3.62	0.55	0.0055	0.49	
Excavator- Earth Scraper	175-300	1	0.367	5.5772	0.7475	0.3085	0.00499	0.2521	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	5.30	1.14	0.32	0.0049	0.22	
Excavator-Motor Grader	100-175	1	0.367	5.6523	0.8667	0.3384	0.00499	0.2799	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	5.37	1.33	0.36	0.0049	0.26	
Excavator- Backhoe/loader	50-100	1	0.408	5.5988	2.3655	0.5213	0.00555	0.473	Lo LF	1.1	2.57	2.29	1.18	1.97	-0.113	0.481	6.16	6.08	1.19	0.0064	0.82	
Excavator - loader	50-100	1	0.408	5.5988	2.3655	0.5213	0.00555	0.473	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	5.32	3.62	0.55	0.0055	0.49	
Vibratory Roller	100-175	1	0.367	5.6523	0.8667	0.3384	0.00499	0.2799	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	5.37	1.33	0.36	0.0049	0.26	
Portable Compaction roller	175-300	1	0.367	5.5772	0.7475	0.3085	0.00499	0.2521	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	5.30	1.14	0.32	0.0049	0.22	
Truck- Water	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Forklift	50-100	1	0.408	5.5988	2.3655	0.5213	0.00555	0.473	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	5.32	3.62	0.55	0.0055	0.49	
Dump Truck	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Service Truck- 1 ton	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Truck- Fuel/Lube	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Concrete Pumper Truck	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Tractor Truck 5th Wheel	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Trucks- Pickup 3/4 ton	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Trucks- 3 ton	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	
Diesel Powered Welder	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	Lo LF	1.1	2.57	2.29	1.18	1.97	-0.094	0.40	7.59	12.85	4.12	0.0052	1.48	
Light Plants	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	None	1	1	1	1	1	-0.094	0.40	6.90	5.00	1.80	0.0053	0.71	
Portable Compaction- Vibratory Plate	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	None	1	1	1	1	1	-0.095	0.408	6.90	5.00	1.80	0.0054	0.70	
Portable Compaction- Vibratory Ram	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	None	1	1	1	1	1	-0.095	0.408	6.90	5.00	1.80	0.0054	0.70	
Articulating Boom Platforms	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	Lo LF	1.1	2.57	2.29	1.18	1.97	-0.113	0.481	7.59	12.85	4.12	0.0063	1.46	
Pumps	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	
Air Compressor 185 CFM	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	None	1	1	1	1	1	-0.094	0.40	6.90	5.00	1.80	0.0053	0.71	
Air Compressor 750 CFM	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	None	1	1	1	1	1	-0.094	0.40	6.90	5.00	1.80	0.0053	0.71	
Concrete Vibrators	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	6.56	7.65	1.89	0.0054	0.89	
Concrete Trowel Machine	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	6.56	7.65	1.89	0.0054	0.89	
Fusion Welder	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	Lo LF	1.1	2.57	2.29	1.18	1.97	-0.113	0.481	7.59	12.85	4.12	0.0063	1.46	
Portable Power Generators	25-50	0	0.408	6.9	5	1.8	0.00555	0.8	None	1	1	1	1	1	-0.095	0.408	6.90	5.00	1.80	0.0054	0.70	

Adjusted factors lbs/gallon (4)							Total Fuel Use	Daily Emissions	Lbs/day (Gals/day)</th

Crane - Mobile 65 ton	1	237.87	31.88	13.16	0.21	7.09	0	0.00	0.00	0.00	0.00	2909	691.96	92.74	38.28	0.60	20.63	
Cranes -Mobile 45 ton	1	241.07	36.96	14.43	0.21	8.28	0	0.00	0.00	0.00	0.00	1600	385.71	59.14	23.09	0.33	13.24	
Cranes - Mobile 35 ton	1	241.07	36.96	14.43	0.21	8.28	0	0.00	0.00	0.00	0.00	3055	736.47	112.93	44.09	0.63	25.28	
Bulldozer D6H	1	226.75	56.00	15.00	0.21	10.88	44	9.98	2.46	0.66	0.01	48	1200	272.10	67.20	18.01	0.25	13.05
Bulldozer D4C	1	202.03	137.47	20.79	0.21	18.44	24	4.85	3.30	0.50	0.00	44	873	176.37	120.01	18.15	0.18	16.10
Excavator- Trencher	1	202.03	137.47	20.79	0.21	18.44	0	0.00	0.00	0.00	0.00	873	176.37	120.01	18.15	0.18	16.10	
Excavator- Earth Scraper	1	223.74	48.29	13.68	0.21	9.43	216	48.33	10.43	2.95	0.04	2.04	1964	439.42	94.85	26.86	0.41	18.53
Excavator-Motor Grader	1	226.75	56.00	15.00	0.21	10.88	40	9.07	2.24	0.60	0.01	44	2545	577.08	142.51	38.19	0.53	27.68
Excavator- Backhoe/loader	1	200.23	197.65	38.81	0.21	26.63	0	0.00	0.00	0.00	0.00	2909	582.47	574.97	112.90	0.60	77.48	
Excavator - loader	1	202.03	137.47	20.79	0.21	18.44	20	4.04	2.75	0.42	0.00	37	727	146.88	99.94	15.12	0.15	13.40
Vibratory Roller	1	226.75	56.00	15.00	0.21	10.88	80	18.14	4.48	1.20	0.02	0.87	5818	1319.23	325.79	87.30	1.21	63.28
Portable Compaction roller	1	223.74	48.29	13.68	0.21	9.43	0	0.00	0.00	0.00	0.00	0.00	5818	1301.70	280.98	79.58	1.21	54.88
Truck- Water	na	170.68	106.79	15.33	0.21	9.59	25.04	4.27	2.67	0.38	0.01	0.24	3642	621.62	388.92	55.82	0.76	34.94
Forklift	1	202.03	137.47	20.79	0.21	18.44	10	2.02	1.37	0.21	0.00	0.18	2000	404.07	274.95	41.58	0.42	36.87
Dump Truck	na	170.68	106.79	15.33	0.21	9.59	50.08	8.55	5.35	0.77	0.01	0.48	1366	233.15	145.87	20.94	0.29	13.10
Service Truck-1 ton	na	74.40	59.47	5.57	0.21	4.83	0	0.00	0.00	0.00	0.00	0.00	1021	75.97	60.71	5.68	0.21	4.93
Truck- Fuel/Lube	na	170.68	106.79	15.33	0.21	9.59	6.26	1.07	0.67	0.10	0.00	0.06	967	165.05	103.26	14.82	0.20	9.28
Concrete Pumper Truck	na	170.68	106.79	15.33	0.21	9.59	0	0.00	0.00	0.00	0.00	0.00	683	116.58	72.94	10.47	0.14	6.55
Tractor Truck 5th Wheel	na	170.68	106.79	15.33	0.21	9.59	0	0.00	0.00	0.00	0.00	0.00	4097	699.28	437.50	62.79	0.86	39.30
Trucks- Pickup 3/4 ton	na	62.81	677.30	46.28	0.27	1.56	12.48	0.78	8.45	0.58	0.00	0.02	4652	292.19	3150.80	215.29	1.26	7.26
Trucks- 3 ton	na	74.40	59.47	5.57	0.21	4.83	12.48	0.93	0.74	0.07	0.00	0.06	4538	337.65	269.85	25.26	0.95	21.93
Diesel Powered Welder	0	297.01	502.84	161.30	0.20	58.01	0	0.00	0.00	0.00	0.00	0.00	924	274.43	464.62	149.04	0.19	53.60
Light Plants	0	270.01	195.66	70.44	0.21	27.64	0	0.00	0.00	0.00	0.00	0.00	3140	847.82	614.36	221.17	0.65	86.80
Portable Compaction- Vibratory Plate	0	264.71	191.82	69.06	0.21	27.03	0	0.00	0.00	0.00	0.00	0.00	473	125.21	90.73	32.66	0.10	12.78
Portable Compaction- Vibratory Ram	0	264.71	191.82	69.06	0.21	27.03	0	0.00	0.00	0.00	0.00	0.00	400	105.88	76.73	27.62	0.08	10.81
Articulating Boom Platforms	0	246.77	417.78	134.01	0.20	47.58	0	0.00	0.00	0.00	0.00	0.00	1036	255.65	432.82	138.84	0.21	49.29
Pumps	na	79.44	13813.38	748.58	0.27	2.35	2.032	0.16	28.07	1.52	0.00	0.00	222	17.63	3066.57	166.19	0.06	0.52
Air Compressor 185 CFM	0	270.01	195.66	70.44	0.21	27.64	10.16	2.74	1.99	0.72	0.00	0.28	1940	523.81	379.57	136.65	0.40	53.63
Air Compressor 750 CFM	0	270.01	195.66	70.44	0.21	27.64	0	0.00	0.00	0.00	0.00	0.00	2806	757.64	549.01	197.64	0.58	77.57
Concrete Vibrators	0	248.99	290.58	71.79	0.21	33.71	0	0.00	0.00	0.00	0.00	0.00	855	212.88	248.45	61.38	0.18	28.83
Concrete Trowel Machine	0	248.99	290.58	71.79	0.21	33.71	0	0.00	0.00	0.00	0.00	0.00	120	29.88	34.87	8.61	0.02	4.05
Fusion Welder	0	246.77	417.78	134.01	0.20	47.58	0	0.00	0.00	0.00	0.00	0.00	581	143.37	242.73	77.86	0.12	27.64
Portable Power Generators	0	264.71	191.82	69.06	0.21	27.03	0	0.00	0.00	0.00	0.00	0.00	277	73.33	53.13	19.13	0.06	7.49

552.5

71440

Totals	114.93	74.98	10.67	0.12	5.96		14405.50	13421.92	2280.33	15.15	985.16
						Tons/yr	7.20	6.71	1.14	0.01	0.49
Applicant Estimate	135.69	64.92	10.07	0.12	6.71		8.06	5.81	1.01	0.01	0.47
Difference	-20.76	10.06	0.60	0.00	-0.75		-0.86	0.90	0.13	0.00	0.02
Percentile	-15.3%	15.5%	5.9%	-3.4%	-11.1%		-10.6%	15.5%	12.9%	-24.2%	4.8%

(rounding issue)

(rounding issue)

(1) - Steady State Emission Factors from Table A2 of EPA November 2002 NR-009b Publication.

(2) - In use adjustment factors per Table A3 EPA November 2002 NR-009b Publication.

(3) - PM10 and SO2 adjustments due to Equation 5 and Equation 7 on pages 18 and 19, Respectively of EPA Report No. NR-009b

(4) - Calculation uses adjusted BSFC and assumed 7.1 lbs/gallon. The onroad and gasoline powered pump emission factors are not adjusted, except for SO2 adjusted for pumps per the gasoline powered 3/4 ton pickup value.